

A PRELIMINARY ACCOUNT OF THE BDELLIDAE (SNOUT MITES) OF AUSTRALIA.

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INTRODUCTION.

While investigating the possibility of biological control of the Clover Spring-tail (*Sminthurus viridis* L.) in Western Australia during 1931-32 on behalf of the Commonwealth Council for Scientific and Industrial Research, the writer was successful in finding a species of Bdellid mite (*Biscirus lapidarius* Kramer) which, while occurring locally in a few districts, was present in such numbers as to be rapidly cleaning up the Sminthurids in those areas.

Besides this particular species of Bdellid many others were found in various parts, and while these did not appear to have any controlling effect on the Collembola, yet the family as a whole is well known to be predatory. The important discovery that at least one species may be of use in biological control has led the author, therefore, to make a thorough systematic study of the Australian species. In addition to his own captures he has had invaluable help from many other enthusiastic collectors in other parts of the country. To all these, and in particular to Mr. L. J. Newman, Government Entomologist of Western Australia, Mr. V. V. Hickman of the University of Tasmania, Hobart, and to Mr. D. C. Swan of the Waite Institute, Adelaide, he tenders his deepest thanks.

The result of the study of *Biscirus lapidarius* and its practical effect in controlling *Sminthurus* has been reported and discussed elsewhere (Jour. C.S.I.R., May, 1933). This paper deals with the specific and generic characters of all species now known to occur in Australia, and is intended to assist State Entomologists and others to recognise the individual species and so be able to distinguish the useful one. It should be borne in mind, however, that all species are predatory, and that under suitable conditions any of them may prove to be of value.

Hitherto, only *Bdella* (*Scirus*) *hospita* Banks has been recorded from Australia and described from specimens found in ants' nests in Victoria and Tasmania by Mr. A. M. Lea. Later on it is shown that this species is synonymous with *Biscirus symmetricus* Kramer.

GENERAL DESCRIPTION.

The mites belonging to this family of the Acarina are small, reddish to blackish, elongate, pear-shaped creatures, with a very pronounced beak and the body divided by a distinct separation into cephalothorax and abdomen. They are placed in the suborder Prostigmata because of the opening of the stigmata at the base of the mandibles. The mouth-parts consist of a cone-shaped rostrum furnished ventrally with a number of hairs, and a pair of dorsal mandibles, each of which carries a terminal pair of shears and dorsally one or more long hairs. The shears of the mandibles may or may not be armed internally with teeth. Immediately below the base of the mandibles arises a pair of five-segmented palpi. These are generally long and the second and fifth segments are usually much longer than the rest. The fifth segment may be parallel-sided or may be widened apically. At the apex of the terminal segment are to be found two or three long hairs, possibly of a sensory nature. The cephalothorax is trapezoidal in shape and dorsally carries 2, 4, or 5 eyes (seldom none), 4 characteristic long sensory hairs ("Pseudostigmalorgane"), 0, 2 or 4 other hairs and often subcutaneous shields

or lines. Ventrally are attached the front two pairs of epimera, and there are a few short hairs. The abdomen is approximately egg-shaped and is furnished dorsally with several rows of from 2 to 4 hairs or setae. Ventrally it carries the two posterior pairs of epimera, an anterior genital opening with hairs and three pairs of discs ("inneren Genitalnäpfen"), and a posterior anal opening.

There are four pairs (three in larva) of six-segmented legs, each tarsus being furnished with two strong claws and a medial hairy empodial appendage. On the tibia and tarsus are usually one or two long sensory setae. The hairs of the legs are of two kinds, simple and feathered.

The colour of the animals is generally reddish but sometimes varies to blackish. The pigment is entirely subcutaneous. The cuticle is very finely striated, striations being generally transverse but sometimes circular or zig-zag. Cross striations occur on the legs and palpi.

The sexes differ mainly in the structure of the genital organs, but occasionally differences are to be found in the relative lengths of the palpal segments, etc.

The immature stages are but little known and have been described for only a few species. The eggs are slightly elliptical and furnished with a number of clavate chitinous spines. They are brownish and laid on the ground or decaying vegetable fibres. The larvae much resemble the adults, except that they have only three pairs of legs and no genital organs. The nymphs are even more like the adults although still lacking the genitalia.

AUSTRALIAN SPECIES.

Of the many species known to science, mainly from the temperate parts of the world, the following only have as yet been found in Australia:—

Cyta latirostris (Herman); *Bdella lignicola* Can.; *Scirus longirostris* Herman; *Scirus dubitatus*, n. sp.; *Biscirus* (*Biscirus*) *lapidarius* (Kramer); *B. (B.) sylvaticus* (Kramer); *B. (B.) intermedius* Sig. Thor.; *B. (B.) symmetricus* (Kramer); *B. (B.) uncinnatus* (Kramer); *B. (B.) australicus*, n. sp.; *B. (B.)*

DESCRIPTION OF FIGURE A.

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|---------|-----------------------------------|--|
| Fig. 1. | <i>Cyta latirostris</i> (Herm.). | Mandibles and palp (after Berlese). |
| " 2. | " | Dorsal view of animal (after Berlese). |
| " 3. | <i>Bdella lignicola</i> Can. | Rostrum, ventral view. |
| " 4. | " | Palp. |
| " 5. | " | Dorsal view of entire animal. |
| " 6. | " | Mandible |
| " 7. | " | Cephalothorax from above. |
| " 8. | " | Tarsus. |
| " 9. | <i>Scirus longirostris</i> Herm. | Mandible. |
| " 10. | " | Palp. |
| " 11. | " | Tibia and tarsus. |
| " 12. | <i>dubitatus</i> , n. sp. | Mandible. |
| " 13. | " | Subcutaneous shield of cephalothorax. |
| " 14. | " | Palp. |
| " 15. | " | Tarsus. |
| " 16. | <i>Biscirus hickmani</i> , n. sp. | Cephalothorax. |
| " 17. | " | Mandible. |
| " 18. | " | Tarsus. |
| " 19. | " | Palp. |
| " 20. | " | Tip of tarsus and claw. |
| " 21. | <i>lapidarius</i> (Kramer). | Dorsal view. |
| " 22. | " | Female genital organ, exerted. |
| " 23. | " | " withdrawn. |
| " 24. | " | Genital organ, male. |
| " 25. | " | Larva, dorsal view. |
| " 26. | " | Rostrum of larva. |
| " 27. | " | Mandible of larva. |

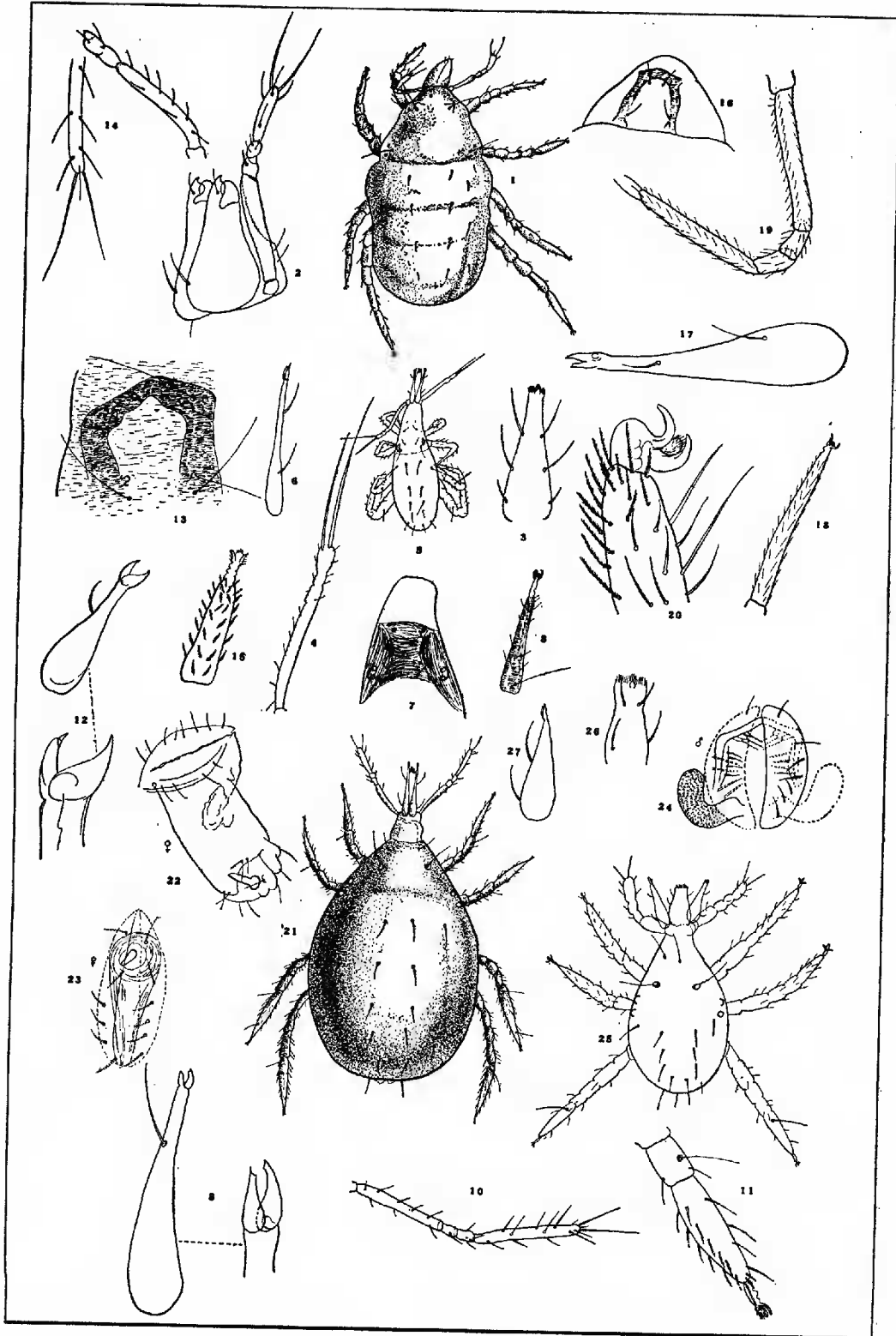


Fig. A. For description see opposite page.

thori, n. sp.; *B. (B.) hickmani*, n. sp.; *B. (Odontoscirus) virgulatus* (Can. et Fanz.).

Of these 13 species, 4 are new to science, the remainder being indistinguishable from European forms. The genera *Trachymolgus* and *Spinibdella* are as yet unknown from this continent, and the genus *Bdella* is only represented by one species. The last genus, however, may be largely increased, both by native and introduced forms.

In working up the systematics (as shown below) of this family, and especially in the identifications, the writer has received invaluable help from Dr. Sig. Thor, of Oslo, to whom he is deeply indebted.

Suborder PROSTIGMATA Kramer, 1877.

Family BDELLIDAE Koch, 1842.

SYNOPSIS OF GENERA (after Sig. Thor).

1. Segment V. of palp shortened and apically broadened, with 2 or 3 long apical hairs. Mandibles each with two dorsal hairs. Thorax with 2 pairs of hairs and usually 2 narrow longitudinal chitinous shields, these seldom absent. 2

Segment V. of palp relatively long, cylindrical. Mandibular hairs 1, 2 or many. Thorax with only 2 or 3 pairs of hairs. No chitinous shields on shoulders, seldom a broad chitinous plate. 5

2. An unpaired median frontal eye and two pairs of lateral eyes. Rostrum and mandibles short and thick. The two longitudinal shoulder shields bound anteriorly by a transverse chitinous line.

Genus *Cyta* Heyden, 1826.

Only the lateral eyes present. Mandibles and rostrum long and narrow. Dorsal shields separated, indistinct or absent. 3

3. Cuticle thick, patterned. No thoracic shields.

Genus *Trachymolgus* Berlese, 1923

Cuticle thin and finely striated. Thorax with longitudinal shields or shorter lines. 4

4. Two longitudinal, relatively distinct thoracic shields. Rostrum and mandibles of normal width. Two long mandibular hairs, one more basal, the other in the middle.

Genus *Bdella* Latreille, 1795.

Two short chitinous stripes with a pair of humps. Rostrum and mandibles very narrow, almost needle-like. Both mandibular hairs very small and placed beyond the middle.

Genus *Spinibdella* Sig. Thor, 1930.

5. Both apical hairs of fifth palpal segment very long. Mandibles with 1 or 2 hairs. 6
Both apical hairs of fifth palpal segment not or only slightly lengthened. Mandibles with many hairs (5-24). Three pairs of dorsal thoracic hairs.

Genus *Molgus* (Dujardin, 1842) Trouessart, 1894.

6. Each mandible with only one hair. No thoracic shields.

Genus *Scirus* Herman, 1804.

7. Each mandible with two hairs. Generally 2 (seldom 3) dorsal thoracic hairs. Distally on thorax a very fine subcutaneous line.

Genus *Biscirus* Sig. Thor, 1913.

Genus *Cyta* Heyden, 1826.

Cyta latirostris (Herman), 1804.

Fig. A, figs. 1-2.

This very small red species is widely distributed in Western Australia. It occurs under bark, etc., where it is probably predaceous on Psocids and other small insects. Apart from its size it is easily recognised by its characteristic shape and by its mandibles. It is a well-known species in Europe and has also been recorded from Northern Africa. A second European species is known, *C. coeruleipes*

(Dug.), which differs in having more elongate mandibles and blue legs. This species has not yet been found in Australia.

Localities.—Perth, W. Aust., May 4, 1931 and onwards, (H. W.); Gooseberry Hill, W. Aust., June 2, 1932 (G. E. N.); Donnybrook, W. Aust., June 29, 1932 (E. M.); Denmark, W. Aust., July 5, 1932 (H. W.); Glen Osmond, S. Aust., June, 1933 (H. W.).

Genus *BDELLA* Latreille, 1795.

Bdella lignicola Can., 1885.

Fig. A, figs. 3-8.

Length to 900 μ . Colour pinkish. Mandibles long and slender with two long hairs; width 25 μ . at widest part; jaws small. Rostrum 200 μ . with three pairs of hairs on ventral surface, the basal pair much smaller and finer than the others. Palpi reaching slightly beyond the tip of the mandible; ratio of lengths of segments I. : II. : III. : IV. : V. = 15 μ . : 160 μ . : 30 μ . : 22 μ . : 35 μ ., total 262 μ ., segment II. with 7 hairs, III. with 1, IV. with 4, and V. with 4, apical setae of segment V. long, the longer one almost as long as the palp, the shorter one two-thirds of the longer. Cephalothorax with the usual arrangement of hairs. Eyes two on each side almost touching, less than a diameter apart. Striation of thorax as figured. Abdomen with five rows of hairs, 4, 2, 2, 2, 4. Legs normally haired.

Specimens of this species have been found by the writer at Glen Osmond, South Australia, in March, 1933, and also in moss from the higher reaches of Waterfall Gully, South Australia, May, 1933.

Genus *SCIRUS* Herman, 1804.

Sig. Thor (1931) gives only 3 valid and 3 incertain species as belonging to this genus. Only one of the valid species has so far been found to occur in Australia, but a new species, *Scirus dubitatus*, n. sp., is here brought forward from Tasmania.

The four species may be separated by the following key:—

1. Palpi of moderate length, segments III. and IV. subequal, V. at least thrice as long as III. and IV. together. 3
Palpi very long, IV. much longer than III., V. at most twice as long as III. and IV. together. 2
2. Palpi long (1,200 μ .) and strong. Segment IV. of palp twice as long as III., V. one and a half times as long as III. and IV. together, II. longer than two-thirds the rostrum. Length to 1,800 μ .
S. porrectus (Kramer).
Palpi extraordinarily long and thin (2,000 μ .). Segment IV. half as long again as III., V. twice as long as III. and IV. together. Length (without rostrum), 2,600 μ .
S. exilicornis (Berlese).
3. Mandibles short and stout, width at widest part not less than one-third the length. Thorax with a very distinct subcutaneous shield, widely bridged anteriorly. Length, 1,625 μ .
S. dubitatus, n. sp.
4. Mandibles more slender, at least four times longer than broad. No thoracic shield. Palp V. slightly shorter than II., apical setae about two-thirds the length of apical segment, segment II. with 10-15 hairs. Jaws of mandible with inner distal tooth.
S. longirostris Herman.

SCIRUS LONGIROSTRIS Herman, 1804.

Fig. A, figs. 9-11.

This common and widely distributed species has been on several occasions observed feeding upon *Sminthurus viridis* and other Collembola, but does not appear to occur in the density necessary for effective biological control. It may possibly be an introduction from Europe.

Localities.—Rottneet Island, W. Aust., January 31, 1931 (H. W.); Perth, W. Aust., May 4, 1931 (H. W.); Waite Institute, Adelaide, S. Aust., May 12, 1930 (?); Guildford, W. Aust., 1931 (H. W.); Busselton, W. Aust., 1931 (H. W.); Waite Institute, Adelaide, S. Aust., June, 1931 (D. C. S.); Middle Swan, W. Aust., June 5, 1932 (H. W.); Bridgewater, S. Aust., June 6, 1932 (D. C. S.); Crawley, W. Aust., June 30, 1932 (H. W.); Sassafras, Viet., December, 1931 (H. G. A.); Muresk, W. Aust., August 5, 1932 (H. G. A.).

***Scirus dubitatus*, n. sp.**

Fig. A, figs. 12-15.

Diagnosis.—Length 1,625 μ . Rostrum 270 μ . with 5 pairs of ventral hairs. Mandibles 300 μ . long, very broad basally, 95 μ . wide with a single hair 135 μ . from apex and 78 μ . long. Palpi 360 μ . long, segments II. : III. : IV. : V. = 180 μ . : 30 μ . : 25 μ . : 157 μ . with respectively 8 : 1 : 3 : 9 hairs, apical setae of segment V. subequal 157 μ . and 152 μ . long. Thorax with a very distinct subcutaneous shield on each shoulder and broadly bridged anteriorly, with three pairs of long sensory setae (cf. fig. A, fig. 13). Body setae normal, 65 μ . long. Tarsus as in figure.

Locality.—Under stones on Mount Nelson, Tasmania, September 2, 1932 (V. V. H.). One specimen.

Remarks.—This is a particularly interesting species in that it has such a distinct thoracic shield and three pairs of thoracic hairs. These characters would place it in the genus *Molgus*, but the single mandibular hair and the long apical setae of the palpi are diagnostic of *Scirus*. In view of difficulties like this one can be pardoned for questioning the justification of such generic characters.

Genus *BISCIRUS* Sig. Thor, 1913.

This genus is divided by Sig. Thor into two subgenera *Odontoscirus* S. T. in which the jaws of the mandibles are toothed, and *Biscirus* s. str. in which they are without dentitions.

As no fewer than nine of the thirteen species of Bdellidae here listed for Australia belong to this genus, the following key is given for all known valid species based on that of Sig. Thor (1931):—

1. Mandibles with teeth to jaws. Subgen. *Odontoscirus* Sig. Thor, 1913

Rostrum 300-420 μ . Mandibles 6-7 times as long as broad, both hairs about 75 μ . apart, distal 180 μ . from tip, proximal 165 μ . from base. Jaws of mandibles of equal length, fixed arm with 2 small teeth, movable arm with 4-5 median teeth (3 in var. *dentata* Sig. Thor, 1931). Rostrum ventrally with 6 pairs of hairs. Palpal segments I. : II. : III. : IV. : V. = 25 μ . : 300 μ . : 45 μ . : 38 μ . : 250 μ . II. with 6 hairs, V. with 6-9 hairs. Apical setae of V. 220 μ . Length of animal without rostrum, 2,000 μ .

B. (O.) virgulatus (Can. et Fanz., 1876).
- Mandibles without teeth. Subgen. *Biscirus* s. str. Sig. Thor, 1913.
 2. Both mandibular hairs in close proximity. 2

Mandibular hairs widely separated. 3
 2. Large species 1,700-2,000 μ . Rostrum 660 μ . ventrally with 5-7 pairs of hairs. Mandibles 600 μ . with 2 adjacent hairs about the middle and 230-260 μ . long. Palpi 1,000 μ . segments I. : II. : III. : IV. : V. = 25 μ . : 460 μ . : 88 μ . : 135 μ . : 330 μ . II. with 4 hairs, III. with 1, IV. with 3, and V. with 7. Apical setae of palpi relatively short, 340 μ . and 290 μ . 4

B. (B.) norvegicus Sig. Thor, 1905 (Europe).
 - Small species 1,100 μ . Rostrum 250 μ . ventrally with 7 pairs of short hairs. Mandibles 220 μ . long, 90 μ . broad at base, as in preceding species but shorter. Hairs of mandibles (65 and 75 μ .) close together in middle. Palpi more like those of *lapidarius* than *norvegicus*, segments I. : II. : III. : IV. : V. = 22 μ . : 110 μ . : 30 μ . : 33 μ . : 105 μ . II. with 3 hairs, V. with 6 hairs with two others near to the apical setae and relatively long as in *norvegicus*. 2

B. (B.) meridionalis Sig. Thor, 1931 (N. Africa).

4. The proximal mandibular hair very much reduced, distal hair normal. Rostrum 405 μ . long with 5 pairs of ventral hairs. Mandibles 470 μ ., proximal hair 145 μ from base, 24 μ . long in female, 6-8 μ . long in male, distal hair 160 μ . from proximal and the same distance from tip, 90-110 μ . long. Segments of palpi, I. : II. : III. : IV. : V. = 30 μ . : 370 μ . : 65 μ . : 65 μ . female, 85 μ . male : 360 μ . Apical setae of palpi 175 and 150 μ . long.
B. (B.) intermedius Sig. Thor, 1928. 5
- Both mandibular hairs normally developed. 5
5. Segment V. of palp only two-thirds the length of II. 6
- Segment V. of palp equal to II. 7
6. Palp V. long and thin. Rostrum with 6-7 pairs of ventral hairs. Length of animal to 1,580 μ . Mandibles 400 μ ., proximal hair 178 μ . from distal, this 126 μ . from tip. Palpi 580 μ . long, segments I. : II. : III. : IV. : V. = 30 μ . : 258 μ . : 40 μ . : 32 μ . : 180 μ ., II. with 5 hairs, III. with 1, IV. with 2, and V. with 9 hairs. Apical setae of V. 232 and 174 μ . long. Mandibular hairs 90 and 120 μ . long.
B. (B.) australicus, n. sp.
- Palp relatively shorter and thicker. Rostrum ventrally with only 2-3 pairs of hairs. Length of animal to 2,000 μ . long. Mandibles 500 μ . long, proximal hair 155 μ . from base, distal hair 120 μ . from tip, these hairs only 50-75 μ . long. Palp V. with only 4 hairs, II. with only 2 hairs, one proximal and one distal.
B. (B.) silvaticus (Kramer), 1881. 8
7. Segment IV. of palps longer than III. 11
- Segment IV. approximately equal to III. 9
8. Segment IV. of palps only one and a half as long as III. 10
- Segment IV. three times as long as III.
9. Palpi and legs with numerous simple and fine short hairs. Length of body 3,000 μ . Mandibles 615 μ ., proximal hair 186 μ . from distal, this 186 μ . from apex, these hairs 145 μ . long. Palpi 2,430 μ . long, segments I. : II. : III. : IV. : V. = 214 μ . : 858 μ . : 143 μ . : 214 μ . : 1,000 μ ., apical setae of V. 256 μ . only a little longer than the rest.
B. (B.) hickmani, n. sp.
- Palpi and legs normally haired. Length of body 1,400 μ . Mandibles 500 μ ., hairs as in *B. (B.) lapidarius*. Palpi 900 μ . long, segments II. : III. : IV. : V. = 350 μ . : 70 μ . : 110 μ . : 300 μ ., II. with 2 (?) distal hairs, IV. with 4 distal and V. with 11 hairs. Apical setae of V. long.
B. (B.) uncinnatus (Kramer), 1898.
10. Palp V. twice as long as IV. Serrated hairs for some distance along tarsi? Rostrum 420 μ . long. Palp V. entirely over-reaching tip of rostrum, II. : III. : IV. : V. = 270 μ . : 40 μ . : 110 μ . : 220 μ . Length of body 1,250 μ .
B. (B.) anomalicornis (Berlese), 1916.
- Palp V. only one-third as long again as IV. Tarsi with only 2-3 serrated setae at tip. Rostrum 640 μ . long. Palpi with the whole of V. and half of IV. over-reaching tip of rostrum, II. : III. : IV. : V. = 450 μ . : 90 μ . : 260 μ . : 350 μ ., II. with 2 hairs, one distal and one basal, III. with 1 hair, IV. with 2 distal hairs and V. with 4. Apical setae of palps equal, 270 μ . long. Mandibles 670 μ . long, proximal hair 239 μ . from distal, distal 180 μ . from tip, these hairs 92 and 120 μ . long, respectively. Rostrum ventrally with two pairs of hairs. Length of body, 3,500 μ .
B. (B.) thori, n. sp.
11. Palpi relatively short and thick, especially segment V. Rostrum 360 μ . long, ventrally with 6 pairs of short hairs. Mandibles with long hairs, the distal one placed about the middle, 120 μ . long, the proximal one 108 μ . long. Palpi 435 μ . long, segments I. : II. : III. : IV. : V. = 24 μ . : 180 μ . : 43 μ . : 48 μ . : 154 μ ., II. with 5 hairs, V. with 8-10 hairs, apical setae 185 μ . and 170 μ .
B. (B.) lapidarius (Kramer), 1881. 12
- Palpi comparatively longer and thinner.
12. Legs slender and sparsely haired. Claws very thick. Palp V. shorter than II. Length, 1,250 μ .
B. (B.) splendidus (Stoll), 1887.
- Legs and claws normal. Palp V. equal to II. Rostrum 500 μ ., ventrally with 5 pairs of hairs. Palpi 800 μ . long, II. : III. : IV. : V. = 340 μ . : 60 μ . : 60 μ . : 340 μ ., II. with 6-7 hairs, IV. with 3-4, and V. with 9-10, apical setae two-thirds the length of V.
B. (B.) symmetricus (Kramer), 1898.

BISCIRUS (ODONTOSCIRUS) VIRGULATUS (Can. et Fanz.), 1876.

Fig. B, figs. 29-31.

This species is very local and has only been taken in one locality in Western Australia. It is well known in Europe, and the writer has also found it on the Cape Flats, in South Africa, in 1930.

Locality.—Pelican Point, Perth, W. Aust., June 2, 1932 (H. W.).

BISCIRUS (BISCIRUS) INTERMEDIUS Sig. Thor, 1928.

Fig. B, figs. 14-15.

This species, hitherto only known from Norway, is apparently widely distributed in Australia. Sig. Thor (1931 a) gives the length of the proximal mandibular hairs as from 15-25 μ . In the Australian specimens this hair varies in length according to the sex; in the female it is about 24 μ . long corresponding to Sig. Thor's measurements, in the male it is much shorter only varying from 6-8 μ . Segments III. and IV. of the palps also show a difference in the relative lengths. In the female sex these two segments are subequal, in the male IV. is one-third longer than III.

Localities.—Beverley, W. Aust., June 4, 1931 (H. W.); Waroona, W. Aust., August 6, 1931 (H. W.); Busselton, W. Aust., August 26, 1931 (H. W.); Mullewa, W. Aust., September, 1931 (H. W.); Cascades, Tasm., June 11, 1932 (V. V. H.); St. Ronan's Well, W. Aust., June 1, 1932 (G. E. N.); Denmark, W. Aust., July 5, 1932 (H. W.); Muresk, W. Aust., August 4, 1932 (H. G. A.).

DESCRIPTION OF FIGURE B.

Fig. 1.	<i>Biscirus lapidarius</i> (Kramer).	Cephalothorax of adult.
" 2.	" " "	Palp of adult.
" 3.	" " "	Mandible of adult.
" 4.	" " "	Tibia and tarsus of adult.
" 5.	" " "	A dorsal seta.
" 6.	" <i>thori</i> , n. sp.	Rostrum.
" 7.	" " " "	Mandible.
" 8.	" " " "	Palp.
" 9.	" " " "	Tip of tarsus and claws.
" 10.	" " " "	Mandibular shears.
" 11.	" <i>australicus</i> , n. sp.	Mandible.
" 12.	" " " "	Palp.
" 13.	" " " "	Rostrum, ventral.
" 14.	" <i>intermedius</i> Sig. Thor.	Palp and mandible of male.
" 15.	" " " "	Base of female mandible.
" 16.	" <i>silvaticus</i> (Kram.).	Palp.
" 17.	" " " "	Mandible.
" 18.	" " " "	Rostrum, ventral.
" 19.	" " " "	Tibia and tarsus.
" 20.	" <i>symmetricus</i> (Kram.).	Left eyes (from remounted co-types).
" 21.	" " " "	Mandible " "
" 22.	" " " "	Rostrum from side. " (Ditto.) "
" 23.	" " " "	" ventral (from other specimens).
" 24.	" " " "	Mandible (from other specimens).
" 25.	" " " "	Cephalothorax (from other specimens).
" 26.	" " " "	Palp.
" 27.	" <i>uncinatus</i> (Kram.).	Palp.
" 28.	" " " "	Mandible.
" 29.	" (<i>Odontoscirus</i>) <i>virgulatus</i> (C. & F.).	Palp.
" 30.	" " " "	Mandible.
" 31.	" " " "	Tibia and tarsus.

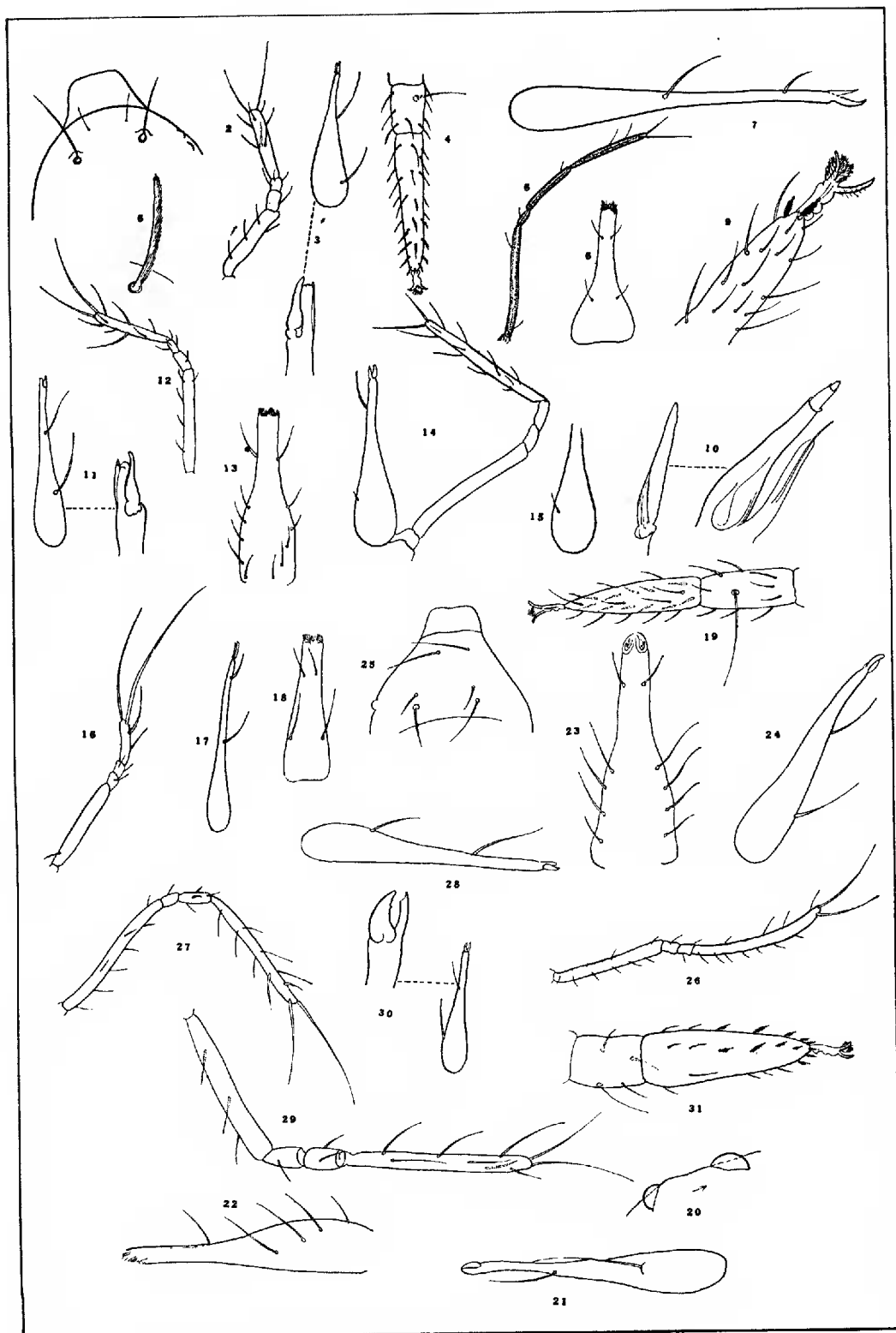


Fig. B. For description see opposite page.

BISCIRUS (BISCIRUS) UNCINNATUS (Kramer), 1898.

Fig. B, figs. 27-28.

This is apparently a rare species in Australia. The material examined agrees entirely with the details given by Sig. Thor, except that in his figure of the palp (after Kramer) he shows only two distal hairs on segment II. In the Australian material there are at least 8 hairs more or less evenly distributed. This species has previously been recorded from America.

Localities.—National Park, Tasm., August 22, 1932 (V. V. H.); Denmark, W. Aust., July 5, 1932 (H. W.).

BISCIRUS (BISCIRUS) SILVATICUS (Kramer), 1881.

Fig. B, figs. 16-19.

This well-known European species has only once been found in Western Australia. The determination was confirmed by Dr. Sig. Thor.

Locality.—Perth, W. Aust., May 5, 1931 (H. W.).

Biscirus (Biscirus) thori, n. sp.

Fig. B, figs. 6-10.

This is a large and local species the specific characters of which have been given in the key. It is named after Dr. Sig. Thor as a slight mark of esteem.

Localities.—Beverley, W. Aust., June 4, 1931 (H. W.); Muresk, W. Aust., June 6, 1932 (H. G. A.).

BISCIRUS (BISCIRUS) LAPIDARIUS (Kramer), 1881.

Fig. A, figs. 21-27; Fig. B, figs. 1-5.

This is a well-known species in Europe and has also been recorded from North Africa. In Western Australia it is widely distributed although rather local. A full description of this species and its possible value as an agent of biological control of the Lucerne Flea (*Sminthurus viridis* L.) have been given elsewhere (J. C. S. I. R., May, 1933). It can be distinguished from its allies by the above key.

Localities.—Waroona, W. Aust., 1931 onwards (H. W.); Denmark, W. Aust., 1931 onwards (H. W.); Burekup, W. Aust., 1931 (H. W.); Benger, W. Aust., 1932 (E. M.); Donnybrook, W. Aust., 1932 (E. M.); Cannington, W. Aust., 1932 (H. W.).

BISCIRUS (BISCIRUS) SYMMETRICUS (Kramer), 1898.

Fig. B, figs. 20-26.

A generally widespread species in Australia south of the Tropics but previously only known from South America. The identification of this species has been confirmed by Dr. Sig. Thor.

In 1916 Banks described *Bdella (Scirus) hospita* from specimens taken in ant nests in Victoria and Tasmania by the late Mr. A. M. Lea. In the South Australian Museum are three co-types of Banks' material. As these were mounted in Canada Balsam it was not possible to make out details sufficient to verify the diagnosis. The writer, however, has remounted the specimens and can now state that they are identical with *Biscirus symmetricus* (Kramer). All three specimens, unfortunately, lack palpi, but the drawing given by Banks fits in with Kramer's species. Banks, however, describes them as having only one eye on each side. This is erroneous for there are distinctly two as shown in a figure of the remounted material.

Whether the specimens were really myrmecophilous is extremely doubtful. Their occurrence in the nests of ants was more probably accidental.

Localities.—Lal Lal, Vict., date ?, A. M. Lea, with ? *Polyrachis hexacantha*; Chudleigh, Tasm., date ?, A. M. Lea, with ? *Iridomyrmex*. In W. Aust. at Muresk, Denmark, Busselton, Mullewa and Albany, 1931-2; Trevallyn, Tasm., August 17, 1929 (V. V. H.); Launceston, Tasm., June 27, 1931 (V. V. H.); National Park, Tasm., March 27, 1932 (V. V. H.); Brown Hill Creek, S. Aust., June 25, 1932 (D. C. S.).

***Biscirus (Biscirus) hickmani*, n. sp.**

Fig. A, figs. 16-20.

This is a very large and striking form, of which only two specimens have so far been collected. In the short terminal setae of the palpi it shows some relationship to the genus *Molgus*. The details of specific value are fully given in the key and amplified by the figures. It is named in honour of its discoverer.

Locality.—Under stones, National Park, Tasm., March 27, 1932 (V. V. H.).

***Biscirus (Biscirus) australicus*, n. sp.**

Fig. B, figs. 11-13.

This species is very closely related to *B. (B.) silvaticus* Kramer but is quite distinct in the length of the palpi and the hairs on the ventral surface of the rostrum, as well as the other characters given in the key.

It has only been found, so far, at Waroona, W. Aust., August 6, 1931 (H. W.), and at Waite Institute, Glen Osmond, S. Aust., June, 1933 (D. C. S.).

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